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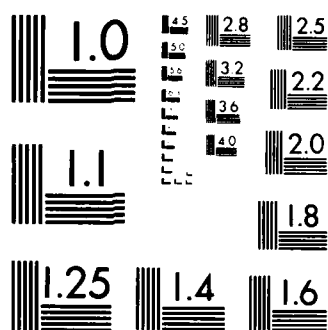
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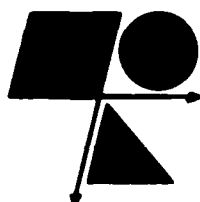
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**U.S. ARMY MATERIEL  
DEVELOPMENT AND READINESS  
COMMAND**

**DARCOM  
MARDIS SUPPORT PROJECT  
DAAK21-80-C-0045 (MARDIS)**

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Report DAAK21-80-C-0045 (MARDIS)

DARCOM MARDIS SUPPORT PROJECT

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Final Report for Period 1 May 1980 - 30 April 1982

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  Abstract - not to exceed 200 words  The DARCOM MARDIS Support Project operates and maintains the DARCOM portion of the MARDIS system. Dedicated support provided by the project is needed to meet requirements of HQDA ODCSRDA, to fill information needs at HQ DARCOM, and to provide technical and functional support to DARCOM and its subordinate elements in matters pertaining to MARDIS. This support is provided under		

contract to DARCOM.

Major efforts accomplished during the current contract period were processing data into the HQ DARCOM MARDIS data base and forwarding it to higher or lower elements in the Army RDTE organization; maintaining all files, logs and records associated with the HQ DARCOM data base; producing reports required by HQDA ODCSRDA, HQ DARCOM and DARCOM's subordinate elements; preparation of periodic and special reports; writing computer programs to fill information needs unique to HQ DARCOM; establishing written operating procedures unique to the project's efforts; recommending corrections or improvements to the MARDIS system; and providing assistance to activities involved with the MARDIS system.

Some characteristics of the MARDIS system make it prone to failure, slow to respond to changing needs, and difficult and time consuming to use. DARCOM's large and varied RDTE mission is reflected in the size and complexity of its MARDIS data base and the difficulty and cost of maintaining it. The DARCOM MARDIS Support Project has made significant contributions to the Army RDTE information process by recommending improvements to the MARDIS system, overcoming its deficiencies whenever possible, making information more readily available to users, and reducing the time and funds required to operate and maintain the DARCOM MARDIS data base.

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# DARCOM MARDIS SUPPORT PROJECT

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## DARCOM MARDIS SUPPORT PROJECT

### 1. EXECUTIVE SUMMARY.

This final report documents the efforts and results of the United States Army Materiel Development and Readiness Command (DARCOM) Modernized Army Research and Development Information System (MARDIS) Support Project. These efforts were performed under contract DAAK21-80-C-0045 during the period 1 May 1980 through 30 April 1982.

The DARCOM MARDIS Support Project operates and maintains the DARCOM portion of the MARDIS system. Dedicated support provided by the project is needed to meet requirements of HQDA ODCSRDA, to fill information needs at HQ DARCOM, and to provide technical and functional support to DARCOM and its subordinate elements in matters pertaining to MARDIS.

All efforts required under the contract's scope of effort were performed in a timely and cost effective manner. Major efforts accomplished were processing data into the HQ DARCOM data base and forwarding it to higher or lower levels in the Army RDTE organization; maintaining all files, logs and records associated with the data base; producing reports required by HQDA ODCSRDA, HQ DARCOM and DARCOM's subordinate elements; preparation of periodic and special reports; writing computer programs to fill information requirements unique to HQ DARCOM; establishing written operating procedures unique to the project's efforts; recommending corrections or improvements to the MARDIS system; and providing assistance to activities involved with the MARDIS system.

Some characteristics of the MARDIS system make it prone to failure, slow to respond to changing needs, and difficult and time consuming to use. DARCOM's large and complex RDTE mission is reflected in the size and complexity of its MARDIS data base and

the difficulty and cost of maintaining it. The DARCOM MARDIS Support Project has made significant contributions to the Army RDTE information process by recommending improvements to the MARDIS system, overcoming its deficiencies whenever possible, making information more readily available to users, and reducing the time and funds required to operate and maintain the DARCOM MARDIS data base.

The only recommendations made in this report are to expand the scope of effort slightly to include the new MARDIS front end subsystem, and to eliminate a costly but unneeded requirement in documenting computer programs.

## 2. INTRODUCTION.

2.1 Purpose. The purpose of this final report is to document the efforts and results of the United States Army Materiel Development and Readiness Command (DARCOM Modernized Army Research and Development Information System (MARDIS) Support Project. These efforts were performed under contract DAAK21-80-C-0045 during the period 1 May 1980 through 30 April 1982.

## 2.2 Background.

2.2.1 The MARDIS System. The developer of the MARDIS system is HQDA ODCSRDA. It is implemented by the U.S. Army Computer Systems Command. Data originates in data bases at the laboratory or research center level and is accumulated in succeeding larger data bases at higher levels in the Army RDTE organizational hierarchy. By its design and content, the system is primarily responsive to HQDA ODCSRDA. Some features of the MARDIS system make it prone to failure and difficult and time consuming to use.

2.2.2 HQ DARCOM MARDIS Data Base. The HQ DARCOM MARDIS data base receives data from 13 subordinate data bases. The lower level data bases support 32 reporting organizations such as major subcommands, project managers, research centers and laboratories. Altogether, there are 106 performing organizations represented in the HQ DARCOM MARDIS data base. The complexity of the data structure found in the data base reflects DARCOM's large and varied RDTE mission.

2.2.3 Support Project Requirement. The size and complexity of the DARCOM MARDIS data base indicated the need for a dedicated support project early in the life of the system. This need was reinforced as time revealed the inefficiency, unreliability and unresponsiveness of the system. Overcoming these problems and providing support to HQ DARCOM in a timely and cost effective manner could not be accomplished by personnel assigned to the task on a part time or transitory basis.

2.3      Scope. This report covers major efforts which were performed by the MARDIS Support Project under contract DAAK21-80-C-0045. Minor efforts routinely performed in the accomplishment of major efforts are omitted. The following major efforts and results are included in this report.

- o    Processing transactions.
- o    Writing computer programs.
- o    Establishing written operating procedures.
- o    Producing standard MARDIS reports.
- o    Preparing periodic and special reports.
- o    Maintaining job control decks.
- o    Preparing ADP report parameter cards.
- o    Developing magnetic tape control logs.
- o    Providing technical assistance.
- o    Manning the MARDIS operations center.

3. MONTHLY STATUS REPORTS. A status report has been prepared at the close of each month throughout the contract period. These reports include work performed during the month, problems encountered, plans for future months, and progress made in overcoming problems and accomplishing planned activities. Although any pertinent topic has been included where appropriate, the following subjects were reported monthly: transaction processing, requests for data, MARDIS system changes and problems, and COBOL programming.

4. SPECIAL REPORTS. Special reports were prepared as requested by HQ DARCOM, and also when this media was appropriate for recommending improvements in the utilization of the MARDIS system.

4.1 DARCOM Requests.

4.1.1 PDF Count by Program Category and Subcategory, June 1980.

4.1.2 Project List by DARCOM Development Team, August 1980.

4.1.3 STOG Number Discrepancies, September 1980.

4.1.4 Split Project Reporting, April 1981.

4.1.5 Project Level Reporting, April 1981.

4.1.6 Milestone Reporting, June 1981.

4.1.7 Changes to PDF Worksheets, August 1981.

4.2 Recommended Improvements.

4.2.1 Availability of Unclassified MARDIS Information, April 1981. This report pointed out that while 83% of the data in MARDIS was not available on a timely basis because it was contained in a classified data base, this factor could be reduced to 54% by establishing an intermediate level data base to receive input from lower level unclassified data bases. This recommendation, which was implemented using existing resources, has resulted in numerous requests for information being filled on a more timely basis and a reduction in the overall cost of maintaining the DARCOM MARDIS data base.

4.2.2 Classification of MARDIS Data, June 1981. This report presented a detailed analysis of how unclassified data could be separated from the DARCOM MARDIS data base in order to make it more readily available to users. It recommended a method which could make as much as 98% of MARDIS data available on an interactive basis. Implementation of this recommendation is pending the availability of computer resources and funds required to establish an unclassified data base management system with interactive access.

5. TRANSACTION PROCESSING. A total of 313,375 transactions have been processed during the contract period. Transaction processing falls into two categories.

5.1 Transaction Tape Processing. Most MARDIS data is processed into lower level data bases and then forwarded on magnetic tape to be processed into the DARCOM data base. 122 of these transaction tapes have been received for processing during the contract period. Using the standard capabilities of the

MARDIS system, each of these tapes would require a separate transaction edit/update job which costs approximately \$320 and takes an hour and forty minutes to run. Shortly before the award of the current MARDIS support contract, personnel now assigned to the project developed a computer program which would allow several tapes to be processed at approximately the same cost as a single tape. This has resulted in savings of over \$20,000 during the current contract period. It has also reduced the time required for transaction processing by more than half.

5.2      Source Document Processing. HQ DARCOM and five of its smaller subordinate activities do not have the facilities to process data directly into MARDIS. They forward their changes to the DARCOM MARDIS support group who processed them into the system, corrects any errors and produces new Program Data Forms (PDF) and reports for them. In the past this was accomplished by transcribing changes onto worksheets, keypunching them and then processing the punched cards. Processing approximately 90 PDF's in this manner is a time consuming job. Since October 1981 all unclassified source documents have been processed on an interactive front end subsystem which is now a part of the MARDIS system. This has reduced the time required to process these documents and eliminated the need for outside keypunch support. Eight classified PDF's still have to be processed the old way.

6.          COMPUTER PROGRAM CHANGE REQUESTS. 24 Computer program change requests were prepared and forwarded to the MARDIS developer for action. Nine of these reported errors in computer programs distributed by the developer and 15 recommended improvements in the MARDIS system.

## 7. COMPUTER PROGRAMS.

7.1 Computer Programs, Technical Reports. Most of the standard reports produced by the MARDIS system are intended for use at HQDA. They do not fill the needs of managers at HQ DARCOM. HQDA will not approve the inclusion of a new report in the MARDIS system unless it has application outside DARCOM. When a new report is accepted it takes six months to a year for it to be fielded. The DARCOM MARDIS support contractor helps to close this information gap by writing COBOL language programs to produce information of interest to DARCOM from the MARDIS data base. these programs, which are tailored to DARCOM's needs, are usually prepared in three months or less and can be modified as DARCOM's needs change. The following technical report programs have been written since the award of the contract.

7.1.1 Program Interchange Distribution Report, completed August 1980. This program produces a report for each DARCOM activity which is scheduled to receive funds from other DARCOM activities. It contains the name of the activities from which interchange funds are to be received, projects from which funds are to be provided and the amount scheduled to be transferred.

7.1.2 Milestone Schedule Report, completed December 1980. This program produces a milestone schedule report on all tasks which contain information about milestones that are of interest to the report user.

7.1.3 Producibility Engineering and Planning (PEP) Program, completed March 1981. This program produces a very detailed report on all tasks which are involved in the PEP program. Contents of the report are a DARCOM-wide summary, a summary for each activity engaged in the PEP program and detailed reports for each PEP task.

7.1.4 Core, Basic and Enhanced Funding Summary, completed June 1981. This program produces a report for use within HQ DARCOM. It replaces an inadequate standard MARDIS report. It gives detail and accumulated funds by funding category, program element and project with funding category subtotals. A DARCOM-wide report is produced followed by a report for each DARCOM activity.

7.1.5 Producibility Engineering and Planning (PEP) Funding, completed February 1982. This program produces a report which lists PEP funds according to the fiscal year in which tasks were initiated. Fiscal year subtotals are provided.

7.2 Computer Programs, Data Maintenance and Management Reports. These reports provide information about MARDIS data which is used to manage the data or to improve its quality.

7.2.1 Program Interchange Validation Report, completed August 1980. This program produces data validation and error lists to be used in correcting the data from which the Program Interchange Distribution Report is created.

7.2.2 DD Form 1634 Aging Program, completed December 1980. The MARDIS system makes no distinction between new projects and tasks started in the current fiscal year and those started in prior years. Therefore, all DD Forms 1634 produced by MARDIS indicate that the effort is new no matter how many years it has been in progress. This program uses a table of efforts started in prior fiscal years to modify the age element in the MARDIS data base so that a distinction between new and continued efforts will be made on the DD Form 1634.

7.2.3 MARDIS Data Base Index. This program was originally written in 1978 by personnel who are now assigned to the MARDIS support project. It has been an invaluable tool in maintaining the MARDIS data base. In April 1981 it was modified to provide a PDF count and the highest data classification for each DARCOM activity, and to give a warning if a PDF is incomplete or contains invalid security codes. In January 1982 it was modified to list each DARCOM subcommand's PDF's by subordinate laboratory.

7.3 Utility Programs. The MARDIS Support contract does not require the writing of utility programs, however, it would be impossible to maintain the DARCOM MARDIS data base without them. These programs are prepared as required, usually under unique emergency conditions. Since they normally fill a one time need they are not documented as are formal report programs. Following are some examples of utility programs which have been prepared to facilitate data maintenance.

7.3.1 Paragraph 5.1, Transaction Tape Processing, pointed out the cost savings realized by using a utility program to concatenate transaction tapes from several sources. This program is modified as required to correct recurring errors which are inserted in data by defective programs in the MARDIS system. This eliminates the rejection of data and the need to correct and reprocess it.

7.3.2 The inefficiency of MARDIS in processing upward flowing transactions is only exceeded by its inefficiency in distributing downward transactions. Using MARDIS to distribute transactions from HQDA or HQ DARCOM to DARCOM's subordinate data bases would take eight hours at a total cost of at least \$1,500. In May 1980 a utility program to accomplish this in 35 minutes at a total cost of less than \$50 was written.

7.3.3 Data Recovery. The MARDIS system has standard procedures for recovering a lost or damaged data base, but they would only work under ideal conditions. Since data bases are ususally lost because of poorly maintained records and/or improper operating procedures, no one has ever been able to use MARDIS's recovery procedures when this has happened. Instead, utility programs are written as required to recover lower level data bases from the DARCOM data base. A requisite of this practice is that the DARCOM data base be maintained in impecable condition. Similiar utilities are wirtten for acitvities who wish to transfer their data from one subordinate data base to another.

7.4 Program Documentation. The current DARCOM MARDIS support contract requires that programs be documented in accordance with NSA Standard DI-H-5201. It requires that the detail flow chart be prepared on the required number of standard size pages, which is a normal practice, and also that it be prepared on a single 22" X 34" sheet. The large sheet has proven costly to reproduce in the required number of copies and it offers no advantage over properly designed flow charts on standard size pages. It is recommended that the 22" X 34" flow chart be excluded from future contract requirements as an economy measure.

## 8. MARDIS USER'S MANUAL, DARCOM CONTROL OFFICE PROCEDURES.

8.1 Requirement. In most cases the MARDIS User's Manual prepared by HQDA ODCSRDA and the MARDIS Computer Operatons Manual prepared by USACSC provide sufficient information to process data into lower level data bases and then forward it to higher levels. They do not cover the many problems that are encountered when data from many sources must be combined into the large complex DARCOM data base and then used to provide information to diverse users.

Keeping the MARDIS system going despite frequent problems and meeting the needs of HQ DARCOM has required the development of many techniques and procedures that are unique to this singular situation. The DARCOM MARDIS control Office Procedures Manual was prepared to provide continuity in the event of personnel changes by expanding on information contained in the other manuals and establishing operating procedures unique to the operation and maintenance of the DARCOM MARDIS data base.

8.2 First Version. The first draft of the procedures manual was started in June 1980 and completed in September 1980, five months after award of the support contract. This early start was made to afford project personnel an opportunity to live with the manual before the final version was prepared. It became apparent that while the first version contained much information about the project, it did not provide the detailed information that would be required by inexperienced personnel.

8.3 Final Version. The first version of the manual was almost entirely scrapped and work was started on the second version in January 1981. This version addressed an audience that had an understanding of data processing and at least a basic familiarization with the MARDIS User's Manual and Computer Operations Manual. It provided more detailed information about how to run the project on a day to day basis and overcome problems of a recurring nature. The final version of the manual contains 14 sections with seven illustrations and nine appendices. It has proven useful to both experienced and inexperienced personnel assigned to the project.

8.4 MARDIS Interactive Front End Subsystem Local User's Guide. The successful use of the front end subsystem during the 1981 Fall update made it apparent that some of the activities who normally submit source documents could use it to process their own input provided they were given training in its use and a more complete set of instructions than that contained in the MARDIS User's Manual. A 19 page user's guide was prepared in January 1982. It is being distributed to users of the front end subsystem as they are being trained. Use of the front end subsystem did not require the development of any unique operating techniques to be added to the DARCOM MARDIS Control Office Procedures Manual.

9. STANDARD MARDIS REPORTS. With the exception of a few instances when the MARDIS subsystem would not produce reports because of program errors, all standard MARDIS reports were produced as requested. At times the production of unclassified reports from the classified data base has been delayed by a lack of dedicated computer time. This has been alleviated to a large degree by establishing an unclassified intermediate data base and by setting all unclassified PDF's aside in a separate file.

10. ADP JOB CONTROL DECKS. The standard MARDIS system consists of six jobs that are run frequently and four that are seldom run. Frequently run jobs will differ slightly depending on the data base level, the media used to record transactions and the media used to record output reports. A total of 44 job control decks have been set up to execute any MARDIS job under all conditions.

11. ADP REPORT PARAMETER CARDS. Standard MARDIS report programs are very flexible in being able to request different reports in different sequences for different activities in a single job. This flexibility is provided through report parameter

cards which are submitted with each report job. As many as 250 parameter cards may have to be prepared to produce all of the reports and PDF sets required after a major update. Saving these cards from one update to the next has proven futile because the reports requested have never been the same. Preparing these cards on an as required basis is the only practical solution.

Instructions for grouping report modules and reported activities to produce reports most efficiently are contained in the DARCOM MARDIS Control Office Procedures Manual.

12. MAGNETIC TAPE CONTROL LOGS. Three magnetic tape control logs are used in maintaining the DARCOM MARDIS data base. They are the incoming transaction log, the data base tape log and the outgoing data tape log. Each element of information recorded on a log is entered under a column heading which clearly defines the contents. Information that is recorded as different events occur is entered in occurrence sequence from left to right across the log. Examples of completed log entries are contained in the DARCOM MARDIS Control Office Procedures Manual.

13. TECHNICAL ASSISTANCE. Technical assistance has been given to functional users and data processing installations on an almost daily basis. In addition to providing assistance in matters pertaining to MARDIS to HQ DARCOM and its subordinate activities, assistance has also been provided to HQDA ODCSRDA, USACSC, the HQDA data processing installation and other Army RDTE developing agencies when requested.

MANNING THE MARDIS OPERATIONS CENTER. Except for a brief period in 1981, two individuals were assigned to the DARCOM MARDIS Support Project at all times. All personnel assigned to the project have had prior experience in electronic data processing, have a working knowledge of the COBOL programming language, and hold a SECRET security clearance. The MARDIS operations center has been manned during normal duty hours under daily operating conditions. Work was also performed at night or on weekends during update cycles or when other critical requirements had to be met.

15. CONCLUSIONS. All efforts required of the DARCOM MARDIS Support Project were met or exceeded. Significant contributions were made to improve the MARDIS system or overcome its deficiencies where this could not be done. Information was made more readily available to users through adaptations of the present system, and a recommendation was made to make it even more available with an enhanced access system. Significant reductions in the cost of operating and maintaining the DARCOM MARDIS data base were realized through computer programs and techniques developed to improve on system capabilities. Cost savings were equaled by a reduction in the time required to accomplish assigned tasks. This, together with the assistance rendered to users of the system, enhanced DARCOM's ability to respond to requirements established by HQDA. These accomplishments could not have been made by personnel assigned to the task on a part time or transitory basis. Standards established during the contract period can only be maintained by a dedicated support group.

16. RECOMMENDATIONS.

16.1 Transaction Front End Subsystem. Maintaining the new MARDIS transaction front end subsystem for processing input from HQ DARCOM and designated activities should be included in the project scope of effort. This should include maintaining all files associated with the subsystem and executing its file maintenance cycle. Training designated activities to use the front end subsystem to process their own input or processing it for them depending on the volume of their data and their capabilities should also be included.

16.2 COBOL Program Documentation. The requirement for a detail flow chart on a single 22" X 34" sheet of paper should be excluded from project requirements. It is expensive to produce, has no utility and diverts personnel from more productive efforts.

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